SECTION 8.14

Geologic Resources and Hazards

8.14 Geologic Resources and Hazards

8.14.1 Introduction

This section evaluates the effect of geologic hazards and resources that might be encountered on the Modesto Irrigation District (MID) Electric Generation Station (MEGS) Project (Project). The objective of this analysis is to evaluate the potential for project impacts from construction or during the operation of the Project. This section presents a summary of the relevant laws, ordinances, regulations, and standards (LORS), the Project setting, environmental impacts, and proposed mitigation measures affecting geological resources. In addition, required permits and permitting agencies are identified.

8.14.2 Laws, Ordinances, Regulations, and Standards

The LORS applicable to geologic resources and hazards are summarized in Table 8.14-1.

TABLE 8.14-1
Laws, Ordinances, Regulations, and Standards

Jurisdiction	Authority	Administering Agency	Compliance
State/Local	California Building Code (CBC), 1998.	City of Ripon (City) Engineering Department	Acceptable design criteria for structures with respect to seismic design and load-bearing capacity.
	California Government Code, Section 53091	City of Ripon	Exempts Project facilities for the generation and transmission of electrical energy by a local public agency, such as MID, from San Joaquin County (County) and City building ordinances.
Local	Community Health and Safety Section of the City of Ripon General Plan, 1998	City of Ripon Building Department	To the extent not exempted by Section 53091, the City shall require all new buildings to be constructed in accordance with the CBC.

8.14.3 Geologic Setting

MEGS is located on Stockton Avenue in the City of Ripon (City), San Joaquin County (County), California (State). The Project site lies along the eastern side of the San Joaquin Valley in the Great Valley geomorphic province. The proposed Project site is located in an area consisting of low alluvial plains and fans characteristic of the Great Valley (Norris and Webb, 1990). The site lies within a broad alluvial plain of the San Joaquin River complex and slopes southerly towards the Stanislaus River, which is less than 1 mile south of the site.

8.14.3.1 Regional Geology

The Great Valley is an approximately 400-mile-long northwest-southeast trending deep structural basin that extends along the center of the state from the Tehachapi Mountains in the south to the Klamath Mountains in the north. The Sierra Nevada Mountain Range lies to the east and the Coast Ranges lie to the west. The structural trough in bedrock formations between the ranges was filled with alluvial, lacustrine, and marine deposits of the Cretaceous, Tertiary, and Quaternary ages. Deposits up to 30,000 feet are present near the western edge of the valley and dip relatively uniformly from each side of the valley towards its axis.

8.14.3.2 Local Geology

The Project site is located in an area of fairly flat topography (elevation approximately 65 feet above mean sea level) in the northern part of the San Joaquin Valley. Five major geologic units lie beneath the site. These units include the metamorphic and igneous basement rock complex, consolidated marine deposits, consolidated volcanic rocks, continental deposits, and unconsolidated older alluvium. Near-surface deposits consist of Quaternary alluvial fan and river channel deposits derived from fluvial systems originating from higher elevations to the east. Figure 8.14-1 (all figures are located at the end of this section) shows the geology within a 2-mile radius of the MEGS Project site.

8.14.3.3 Stratigraphy

The younger geologic units are those that affect the site most directly. These units include recent river channel and alluvial plain deposits, and the Quaternary Modesto, Riverbank, and Turlock Lake Formations. Below the Turlock Lake Formation is the Tertiary Mehrten Formation. These are discussed in further detail below. Descriptions are taken from Wagner et al. (1990) and CH2M HILL (1995).

Recent Deposits

Recent deposits consist of river channel and flood plain deposits from local sources. Thickness ranges up to 50 feet. Material typically consists of sand, silt, and clay.

Quaternary Modesto Formation

The Modesto Formation is an alluvial fan deposit that typically consists of discontinuous, lenticular clay and silt lenses interbedded with sand-rich sediments derived from the Sierra Nevada. The formation’s thickness ranges from 50 to 100 feet.

Quaternary Riverbank Formation

The Riverbank Formation is also an alluvial fan deposit that consists of similar deposits as the Modesto Formation but also contains a regional clay layer referred to as the Corcoran clay. The Corcoran clay has been mapped over a large area of the San Joaquin Valley and is the thickest and most widespread clay layer. It is often also termed E-Clay or Blue Clay. The Corcoran clay acts as an aquitard between the overlying unconfined aquifer and the underlying confined aquifer. The formation’s thickness ranges from 150 to 200 feet.

Quaternary Turlock Lake Formation

The Turlock Lake Formation consists of sandstone, siltstone, and conglomerate derived mainly from Sierran granitic and metamorphic source rocks. It may also contain the Corcoran clay and is non-marine in origin. The formation’s thickness ranges from 350 to 850 feet.

Tertiary Mehrten Formation

The Tertiary Mehrten Formation contains non-marine agglomerate, conglomerate, tuffaceous sandstone, and siltstone, which are derived from andesitic sources. The Tertiary Mehrten Formation also contains some andesite mudflow breccia (lahar). The formation is consolidated to the point of a very dense, partially to fully cemented mudflow in many areas and its thickness ranges from 800 to 1,200 feet.

8.14.3.4 Structure

The structural geology of the area is not complex, and the area contains no major deformations associated with historic tectonic activity, presence of faults, or landslides.

8.14.3.5 Seismicity

The Project site is not within an area of major fault activity. The Central Valley of California is considered to be an area of relatively low seismicity. During the formation of the Coast Ranges and the Sierra Nevada, numerous faults and shear zones developed. These faults are primarily in the foothills of the Sierra Nevada Mountains to the east and in the Coast Ranges to the west. A few faults extend beneath the Central Valley sediments. The nearest fault to the site is the Vernalis fault, which is a northwest-southeast trending fault approximately 10 miles southwest of the Project site. The San Joaquin fault lies approximately 13 miles southwest of the Project. The Stockton fault lies approximately 14 miles to the northwest. These three faults are considered active (Jennings, 1994), although there has not been any measurable activity in Quaternary time (1.6 million years). Approximate fault alignments are shown on Figure 8.14-2. East of the site, numerous faults associated with the Sierra Nevada block are present, but they are more than 30 miles from the Project site. The site is not located within a special study zone, as delineated by the Alquist-Priolo Special Studies Zone Act of 1972; and no known fault, active or inactive, reaches the surface within the Ripon area.

The nearest fault system east of Project site is the Foothills fault system containing the Bear Mountain and Melones fault zones. They are approximately 30 miles east of the site. This fault system was considered inactive until 1975 when a Richter magnitude 5.7 earthquake occurred near Oroville. Subsequent to this event, the Foothills fault system was re-evaluated from inactive to having a potential Richter magnitude of 6.5 anywhere along its trace.

The major faults, which have historically produced earthquakes of the greatest magnitude in central California, are the Calaveras, Hayward, and San Andreas faults in the Coast Ranges; the Greenville and Midland faults on the west side of the Great Valley; and the Sierra Nevada and Owens Valley faults east of the Sierra Nevada mountains. These principal faults could affect the Project site. The maximum credible earthquakes and peak site acceleration for the major fault systems are addressed in a site-specific geotechnical report that will be provided to the CEC upon receipt.

8.14.4 Impacts

Presented below are the CEQA Checklist questions used to assess the significance of potential impacts.

8.14.4.1 Environmental Checklist

The checklist in Table 8.14-2 is used by the California Energy Commission (CEC) to assess the significance of potential impacts.

TABLE 8.14-2
CEC Environmental Checklist

	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant	No Impact
Geology—Would the Project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving the following:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault. Refer to Division of Mines and Geology Special Publication 42.				X
ii) Strong seismic ground shaking.		X		
iii) Seismic-related ground failure, including liquefaction.			X	
iv) Landslides.				X
b) Result in substantial soil erosion?				X
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse due to the loss of topsoil?			X	
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?				X
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?				X
Mineral Resources—Would the Project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?				X
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?				X

8.14.4.2 Discussion of Impacts

No active faults cross the Project site and the vicinity of the site is not within the Alquist-Priolo Earthquake Fault Zone (CDMG, 1999).

The most likely geologic hazard at the Project site is ground shaking from a seismic event.

Because the site is located in the eastern Central Valley, there is a low potential for strong seismic ground shaking.

Since the Project site is relatively flat, the potential for slope instability (landslides, soil collapse) and substantial soil erosion is considered minimal. The lithologic types typically present in the eastern Central Valley include sand, silty sand, sandy silt, and clay. These soil types were encountered in the borings advanced during the geotechnical report investigation. Groundwater was encountered about 24 feet below grade (Kleinfelder, 2003).

The geotechnical report states that the subsurface soils encountered below groundwater during the investigation are adequately dense and subsequently not susceptible to liquefaction (Kleinfelder, 2003). The draft site-specific geotechnical report further states that the site is suitable, from a geotechnical standpoint, for support of the proposed peaking plant (Kleinfelder, 2003). A copy of the final geotechnical report will be provided upon receipt.

No mineral resources of significant commercial value were noted to be present at the Project site according to Open File Report 77-16 (CDC, 1977). The Project site area was classified in the report as "containing no significant mineral resources (MRZ-1)." Active aggregate mining occurs approximately 10 miles east of the Project along the north side of the Stanislaus River, which will not be affected by the Project. No recreational or scientific resources are known to exist at the Project site.

8.14.3 Mitigation Measures

Mitigation measures are necessary for the Project site because of potential geologic hazards. Therefore, the following measure is proposed for MEGS:

- Design and construct the Project to conform to the California Building Code (CBC) requirements for Seismic Zone 3.

8.14.4 Involved Agencies and Agency Contacts

The City of Ripon Building and Engineering Departments are responsible for the compliance of construction projects with regard to geologic hazards. Table 8.14-3 presents contact information for the City of Ripon.

8.14.5 Permits Required and Permit Schedule

No permits that specifically address geologic resources and hazards were identified. Compliance of building construction to CBC standards is covered under engineering and construction permits for the Project.

TABLE 8.14-3
Agency Contacts

Agency	Contact	Title	Address	Telephone
City of Ripon – Building Department	Ted Johnson	Chief Building Inspector	1210 S. Vera Ave. Ripon, CA 95366	(209) 599-2613
City of Ripon – Engineering Department	Matthew Machado	City Engineer	259 N. Wilma Ave Ripon, CA 95366	(209) 599-2108

8.14.6 References

California Building Code (CBC). 1998. California Code of Regulations, Title 24, California Building Standards Code.

California Department of Conservation (CDC). 1977. A Mineral Land Classification Study of the Stanislaus River Area. Open File Report 77-16.

California Department of Water Resources (DWR). 2002. DWR online groundwater level database in the Ripon area. Information obtained from the DWR website at: http://wdl.water.ca.gov/gw/gw_data/hyd/Rpt_Hist_Data5_gw.asp?wellNumber=02S07E24R002M.

California Division of Mines and Geology (CDMG). 1999. Alquist-Priolo Zone Maps Index. Information obtained from the DMG website at: http://www.consrv.ca.gov/dmg/.

CH2M HILL. 1995. Development of a Groundwater Management Plan – Technical Memorandum. Prepared for the Stanislaus and Tuolumne Rivers' Groundwater Basin Association. Draft. March.

City of Ripon. 1998. Community Health and Safety Element. City of Ripon General Plan.

Jennings, C.W. 1994. Fault Activity Map of California and Adjacent Areas. Division of Mines and Geology.

Norris, R.M. and Webb, R.W., 1990. *Geology of California, 2nd Edition*. John Wiley and Sons. New York. 365 pp

Uniform Building Code. 1994.

Wagner, D.L., Bortugno, E.J., and McJunkin, R.D., 1990. Geologic Map of the San Francisco-San Jose Quadrangle, California. California Division of Mines and Geology. Regional Geologic Map Series, 1:250,000 scale.

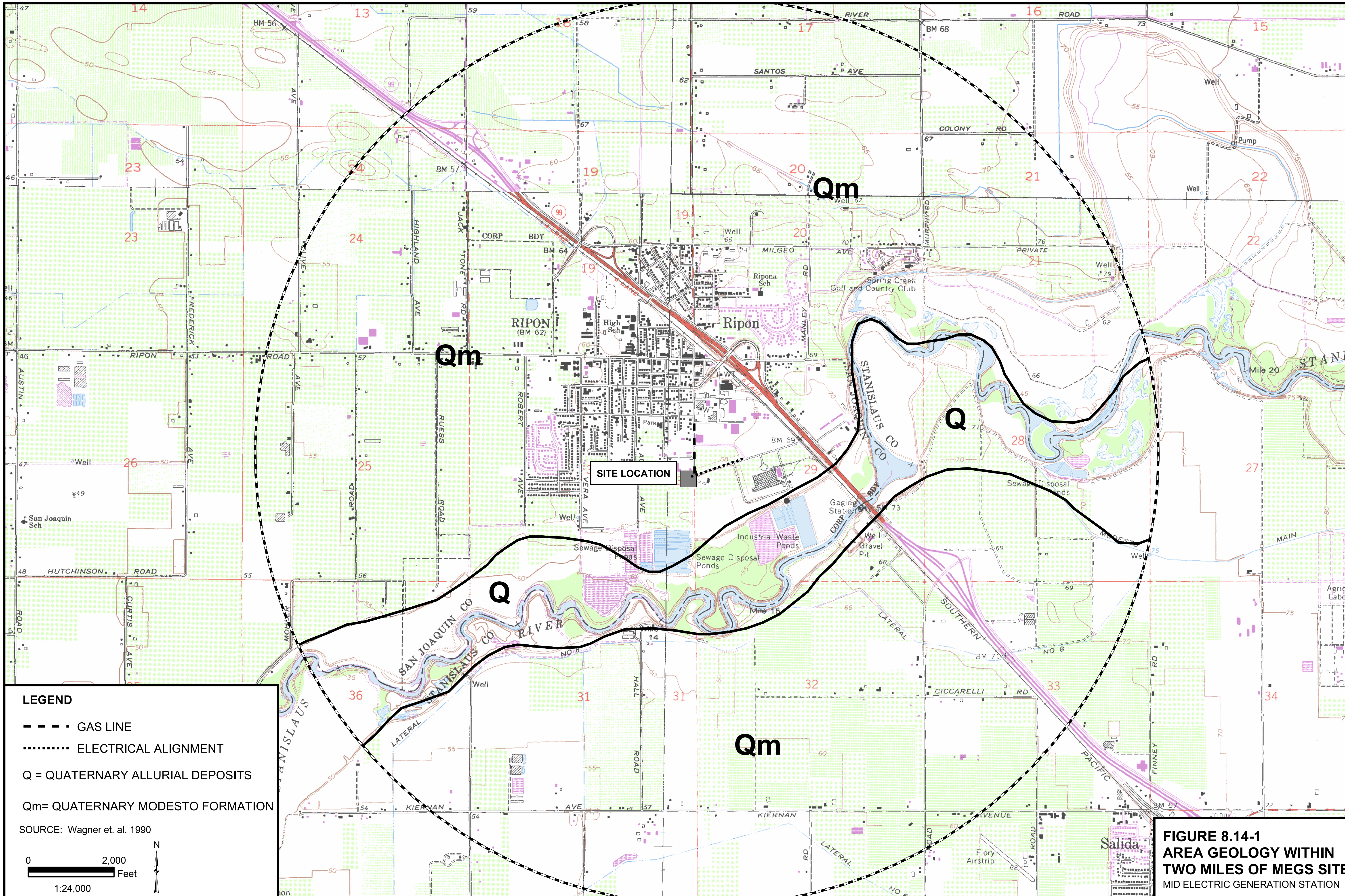

FIGURE 8.14-1
AREA GEOLOGY WITHIN TWO MILES OF MEGS SITE
MID ELECTRIC GENERATION STATION

File Path: \\Thor\Cart1\rddgis\mid\rpp_2mile_drg.mxd, Date: March 18, 2003

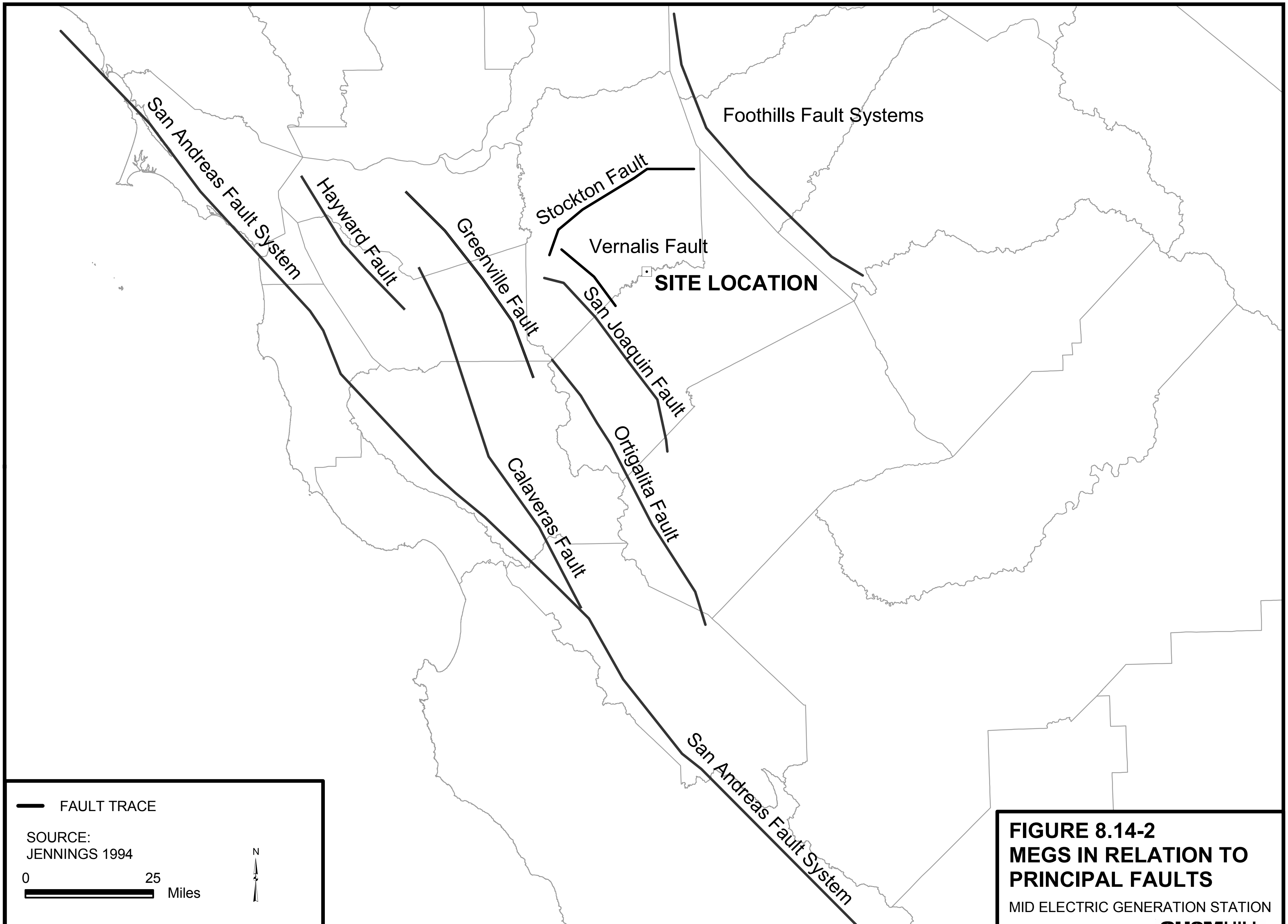

FIGURE 8.14-2
MEGS IN RELATION TO PRINCIPAL FAULTS
MID ELECTRIC GENERATION STATION
CH2MHILL

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